kommenden Rohmaterialien, Produkte, Nebenproduckte und Hilfssubstanzen" has been published by Messrs. Vieweg and Son, Brunswick. The work is a standard one on sugar from the point of view of the technical chemist, and the new edition contains several additions which increase its value.

MESSRS. VIEWEG AND SON, of Brunswick, have issued the third edition of Dr. Robert Fricke's treatise on the calculus and differential equations ("Hauptsätze der Differential und Integralrechnung"). It is writen primarily for use in technical schools, but it contains in the compass of 218 pages the principal subject-matter commonly studied by the average mathematical student, including an appendix on functions of complex variables.

MESSRS. J. AND A. CHURCHILL have published a sixth edition of "Quantitative Chemical Analysis," by Dr. Frank Clowes and Mr. J. B. Coleman. This edition differs from the last in that the section on organic chemistry has been revised, and processes for determining molecular weight by elevation of boiling point and for the analysis of aluminium alloys have been added. Moreover, to facilitate necessary calculations, tables of four-figure logarithms have been added.

THE first number of a new illustrated magazine dealing with scientific subjects, and called *La Science au XX^e Siècle*, has appeared. The magazine is published in Paris, under the editorship of M. G. Maneuvrier, by M. Ch. Delagrave. Judging by the contents of this issue, the new journal should be popular; there are, with others, articles on Mont Pelée, on wireless telegraphy, and on the scientific work of M. P.-P. Dehérain. Attention is also given to the experimental teaching of science in schools, several experiments suitable for school laboratories being described. Applied science receives due attention, and separate sections are devoted to zoology, applied chemistry, botany, physics and photography.

PROF. H. H. TURNER, Savilian professor of astronomy in the University of Oxford, contributes to the *Fortnightly Review* for April a reply to Dr. Wallace's article on "Man's Place in the Universe" which was published in the same review last month. Dr. Wallace suggested that the universe is limited in extent; that it has a definite centre at which the solar system is, and has been situated for millions of years; and that by reason of its position the earth has had an opportunity to develop humanity, and probably this opportunity has been nowhere else in the universe. Prof. Turner shows that the limitation of the universe is not proved; that there is no true centre of the universe, even if limited, and even if there were the solar system could not occupy it for long, on account of the sun's proper motion; he also shows that there is no reason whatever why life should not be developed in any part of the interior of even a limited universe.

THE new issue, the fortieth, of "The Statesman's Year-Book," edited by Dr. Scott Keltie, is conspicuous for its exhaustive completeness. An examination of its contents suggests that similar annual compilations dealing respectively with the data of each of the great divisions of science would be of great value to men of science everywhere. Dr. Keltie points out that recent important events have necessitated the addition of much further information. Among these occurrences may be mentioned the final incorporation of the two South African Republics in the British Empire, and the passing of the new Education Act. Further details have been embodied of the recent censuses taken in various countries—the British Empire (especially India), France, Germany, and the United States. The maps and diagrams, as usual, add greatly to the interest and value of the "Year-Book." There are maps of the new arbitration boundary between Chile and the Argentine Republic, the new Abyssinian boundary, and the transcontinental railway projects. Diagrams exhibit graphically comparative tonnage of merchant shipping belonging to the principal countries for the past twelve years, comparative outputs of iron-ore and of coal of the principal countries for the last twenty years, the public debt of the principal countries in pounds sterling for the past eleven years, and the emigration from the principal countries for the last ten years.

IN following up their researches on chemical affinity at low temperatures, Messrs. Moissan and Dewar describe in the current number of the *Comptes rendus* further experiments on liquid fluorine. Various substances, dried with care, and previously cooled to −190° C. by liquid air with the exclusion of atmospheric moisture, were brought in contact with liquid fluorine also at −190° C. No reaction was observed with iodine, oxygen, tellurium, nitrogen, antimony, carbon, silicon, and boron. On the other hand, sulphur, selenium, phosphorus and arsenic catch fire on contact with the liquid, the reaction with calcium oxide and anthracene being still more violent; potassium, after a short time, gives rise to a violent explosion. It is evident, therefore, that even at this low temperature the forces of chemical affinity are not suspended when so energetic an element as fluorine is concerned.

THE additions to the Zoological Society's Gardens during the past week include a Pinche Monkey (*Midas oedipus*) from Colombia, presented by Mr. A. G. Kemp; a Blood-rumped Parrakeet (*Psephotus haematonotus*) from Australia, presented by Mr. B. C. Thomasset; a Sparrow Hawk (*Accipiter nisus*) from Pekin, presented by Mr. W. R. G. Bond; a Moor Monkey (*Semnopithecus maurus*) from Java, ten Olivaceous Lizards (*Lacerta littoralis*, var. *olivacea*) from the Island of Brazza, deposited; a Bactrian Camel (*Camelus bactrianus*), a Mouflon (*Ovis musimon*), a St. Kilda Sheep (*Ovis aries*, var.), five North African Jackals (*Canis lupaster*), born in the gardens.

OUR ASTRONOMICAL COLUMN.

COMET 1902 *d*.—Herr F. Ristenpart gives a daily ephemeris for this comet in No. 3853 of the *Astronomische Nachrichten*. The following is an abstract therefrom:—

12h. M.T. Berlin.

Date.	α 1903·0 h. m. s.	δ 1903. ° ′ ″	log r.	log. Δ	Magnitude
April 10	7 6 22·58	+30 37 6·7	0·4447	0·4306	11·76
14	7 11 12·85	+31 10 38·1	0·4452	0·4395	
18	7 16 20·11	+31 41 34·7	0·4458	0·4482	
22	7 21 43·29	+32 9 59·6	0·4465	0·4567	
26	7 27 21·62	+32 35 57·0	0·4472	0·4650	
30	7 33 13·88	+32 59 29·5	0·4481	0·4731	11·94

An observation made by Herr Millosevich on February 21 gave a correction of −0·91s., −59″·6 to this ephemeris.

COMET 1903 *a*.—The apparent brightness of this comet is now rapidly declining, having reached its maximum value (eighty-two times its brightness when discovered) on March 28. The comet is now too near to the sun in R.A. to be observed, and in any case its great southerly declination would prevent its observation in these latitudes.

An ephemeris published by M. Paul Brück in No. 3851 of the *Astronomische Nachrichten* gives its position for April 13 as α=0h. 8m. 58s., δ=−41° 5′·6, and its brightness as 36, taking its brightness when discovered as unity.

Variation of Solar Radiation Received on the Earth's Surface.—In a paper published in No. 11 (1903) of the *Comptes rendus*, M. Henri Dufour discusses a series of observations, extending from October, 1896, to March, 1903, which show that the amounts of the solar radiation recorded during December, 1902, and January, February, and the first half of March, 1903, were considerably below the average amounts received during these months, respectively, for the last seven years.

The observations on which the above statement is based were made at two stations about 20 kilometres apart, and during the whole of the period each set of observations has been recorded by the same observer. The observers have used exactly similar instruments, the actinometers of M. Corva, one of which has been verified by the inventor himself and the other checked by it, and the observations exactly corroborate each other.

The figures obtained for December were so small as not to warrant any conclusive statement as to the decreased insolation, but the figures obtained during January, February and part of March corroborate them, and show that for these three months the insolation, per sq. cm., was 0·11, 0·15 and 0·19 (calories—gramme-degrees—minutes) less than the mean for the same months during the past six years.

M. Dufour seeks to explain this decrease by supposing that the atmosphere at the present time contains some matter which is absorbing an abnormal proportion of the solar radiation, and suggests that the volcanic dust thrown out by Mont Pelée may be the cause.

Annals of the Royal University Observatory of Vienna.—Vol. xiv. of these *Annals*, edited by Prof. Edmund Weiss, director of the observatory, contains the detailed results of the observations of minor planets and comets made with the 16·2-cm. Fraunhofer refractor during the period from August, 1895, to January, 1899, and with a 67-cm. Grubb refractor and a 38-cm. equatorial coudé during the years 1897 and 1898.

The tables include the details of the observations of the positions and magnitudes of twelve comets (1895 iii. to 1898 x. inclusive), the positions of twenty-nine NGC nebulæ and one new one, and the positions and magnitudes of many minor planets, including those of Eros observed during 1898.

Vol. xvii. of the same *Annals* contains a "dictionary" of B.D. stars, wherein references are given, opposite each star's B.D. number, to all the other catalogues containing details about the star in question.

A Variable, or Temporary, Star in Lyra.—Herr Seeliger, in a communication to the *Astronomische Nachrichten* (No. 3857), describes and gives a chart showing the position of a faint star (10, 1903, Lyræ) which appears on two plates obtained with the $4\frac{1}{2}$-inch telescope of the Munich Observatory by Herr E. Silbernagel on September 2 and 3, 1902. The star in question occupies the position $\alpha = 18h.\ 48m.\ 42s.$, $\delta = +32° \ 39'·0$ (1855), and is about 30s. preceding and 12'·0 south of the Ring Nebula; on the two plates mentioned above it was equal in magnitude to two twelfth magnitude stars between which it is situated, but on plates taken on June 28 and December 10, 1902, on which these two stars are plainly visible, it does not appear. Neither is it shown on any one of thirteen plates, showing thirteenth magnitude stars, obtained with a 6-inch telescope on various dates between July, 1895, and July, 1902, nor does it appear on two plates taken with a 16-inch objective on July 10, 1901, and July 19, 1902, although these plates show stars of magnitudes 15 and $13\frac{1}{2}$ respectively.

Prof. Max Wolf obtained two photographs of this region, one on January 14 and the other on February 6, 1903; the first showed images of stars of the thirteenth magnitude, and the second, which had 2h. 10m. exposure, showed much fainter objects, but on neither plate does the star 10, 1903, Lyræ appear.

In an editorial note appended to Herr Seeliger's notice is a communication from Prof. Hartwig, in which he states that he observed the star 10, 1903, Lyræ on the morning of March 8 (May 7, 16·25h., M.T. Bamberg) with a 10-inch refractor, and found it to be of about the fourteenth magnitude, 0·2m. brighter than its nearest neighbour.

THE FORMATION OF DEFINITE FIGURES BY THE DEPOSITION OF DUST.

It was hardly to be expected that a fine dust when separating out from the air could easily be made to deposit in perfectly sharp, clear, and constant figures, but this is easily done by simply raising the plate, on which the deposit is to take place, a few degrees above that of the surrounding air, and in five to six minutes, in place of a uniform deposit, which would naturally be expected, a perfectly definite figure is formed; the dust will be heaped up in certain places, and in others the plate will be without a trace of deposit upon it. That a plate, bombarded on every side by a thick dust, should be able to compel by means of a very small amount of heat added to it the falling particles to arrange themselves in such definite forms is undoubtedly remarkable.

The active agents in bringing about these results are, no doubt, the currents of air set up round and on the plates, but that their flow should be so regular, so persistent, and so powerful, is more than could have been anticipated. The figures, although very easily formed, are in many cases very complicated, and, notwithstanding the deposit giving a clear and constant record, still at present it remains an unsolved problem how these complicated effects are brought about. Diminished atmospheric pressure does not affect the figures formed.

The material of the plate on which the dust is to settle is not a matter of consequence; it may be of metal, glass, ebonite, india-rubber, or cardboard, and the same figure will be formed, but obviously on some materials the dust will be more visible than on others. A glass plate is probably the best substance on which to receive the deposit, and the best dust to use is that produced by burning magnesium ribbon, for it is brilliantly white, and is readily obtained in any quantity. A glass receiver, or a box of any kind without a lid, will serve as a receptacle for the dust. Light the magnesium and invert the receiver over it, and if sufficient magnesium be used, a dense atmosphere of dust is formed. The plate on which the figure is to form should be raised about an inch above the table on a small support, and then the receiver, filled with the dust, placed over it and left there for six or seven minutes. The plate, previous to placing it in the dust must be warmed; if it be glass, pass it over the flame of a lamp until the moisture, at first condensed on the under side, disappears; other materials may be treated much in the same kind of way, or heated in an air bath. The essential point in order to obtain a good figure is that the plate should be a few degrees, 10° or 15° C., above that of the dust atmosphere. If it be of nearly the same temperature, then the figure is but faint, and the same happens if it be some 100° to 120° above the temperature of the surrounding air, and if of still higher temperature, no deposit of dust takes place.

Suppose now the experiment is made with a square glass plate, treating it as above described; on removing the plate from the dust receiver, most of the dust having subsided, the plate will be found not covered all over with a fine deposit, but a clear and most delicately drawn cross, consisting of four rays, each starting from a corner of the plate and reaching to the centre, is seen. Under the above conditions, the figure is absolutely constant; it may be dense or faint, and it may be slightly distorted by conditions now well known and described, but on a plate of this shape it is always a cross that is formed. The figure starts from the four corners, but vary the form of the plate and you vary the form of the figure deposited on it. The corners being the agents which principally, if not entirely, determine the figure, and in this simplest case a square, it is not difficult to imagine that even the slight heating of the plate is sufficient to start currents of air, which, flowing round the edges of the plate, carry the dust with them, and allow it only to fall where a comparatively still atmosphere exists. In other cases, the flow of the currents seems very difficult to follow, still with such definite and easily produced pictures it may be possible to follow the changes they undergo.

On the square plate, the action of each corner is evident, and this action of corners is still more clearly shown if a plate in the form of an octagon be used (Fig. 1). With a triangular plate, a figure of three limbs is produced, and so on with other shapes, the corners always determine the general figure, and if there be no corners, if the plate be